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ABSTRACT

The Program in Science, Technology, and Society at the Massachusetts Institute of Technology is described. Two broad aims of the program are to explore the influence of social, political, and cultural forces on science and technology, and to examine the impact of technologies and scientific ideas on people's lives. Although based in the School of Humanities and Social Science, the program is meant to be an Institute-wide forum for students and faculty from many different departments. At the undergraduate level, courses examine such issues as the influence of ethical and political values on the work of scientists and engineers; how technological changes have altered the character of human work; the social implications of design alternatives in engineering; and issues related to the development of the automobile and the growth of nuclear power. Eventually, a structured undergraduate degree program will be developed. A variety of arrangements for graduate students who wish to explore these areas is available, but a graduate degree program does not currently exist. The program's current and and prospective research projects are arranged under three general headings: the social study of science; technology and the organization of industrial society; and cultural systems in industrial societies. Projects under these areas are described, along with other program activities, including faculty seminars and public lectures, senior and postdoctoral fellowships, and a quarterly review. Information on funding, faculty descriptions, and 1980-81 course descriptions are included. (SW)

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Program in Science, Technology, and Society

Massachusetts Institute of Technology

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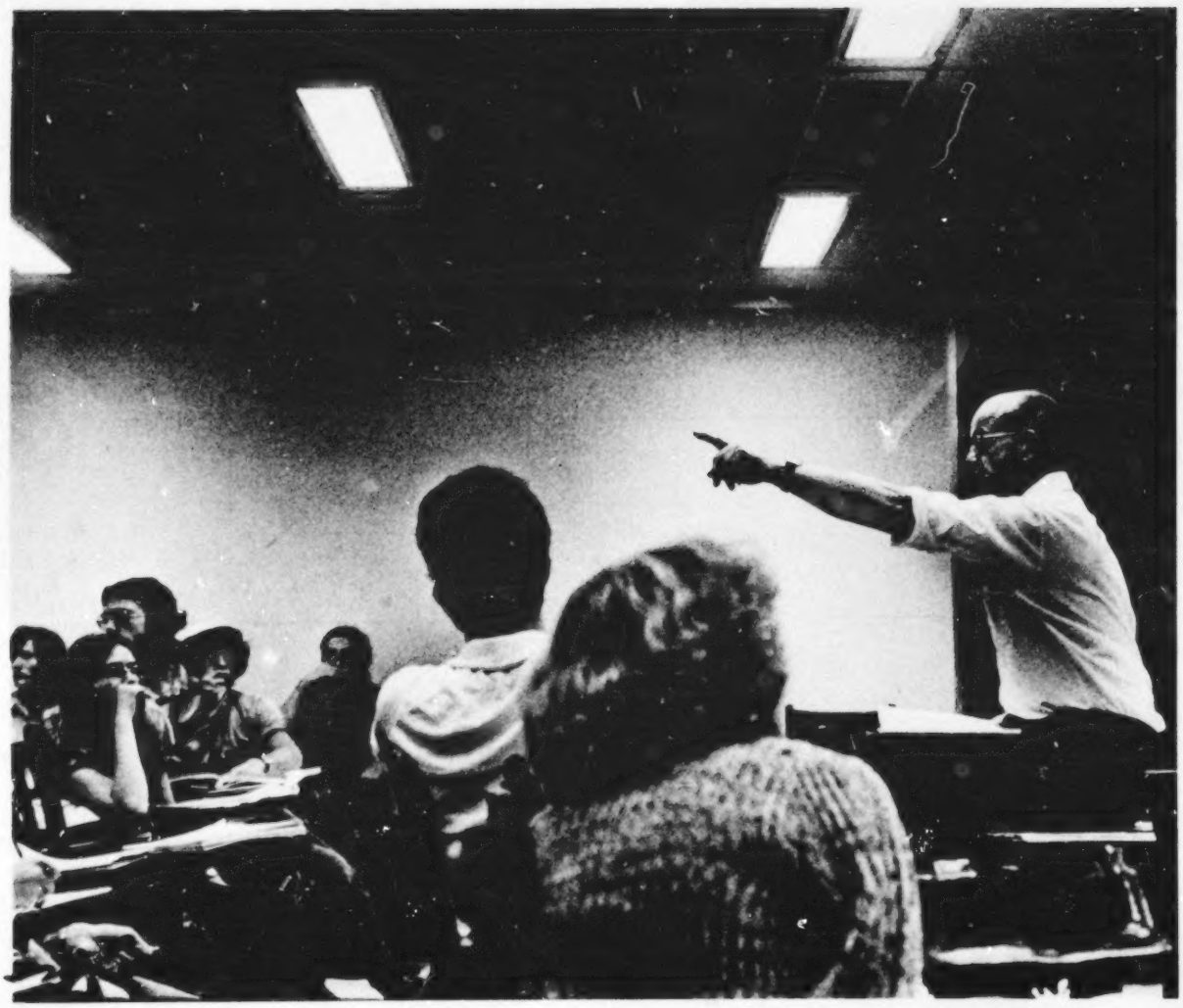


Robert S. Morison

Origin and Purpose

The rapid growth of science and technology in the 20th century has raised basic questions about how scientific ideas and technical systems interact with society and with individuals. To provide a context for the systematic study of these questions, the Massachusetts Institute of Technology in 1977 established the Program in Science, Technology, and Society (STS).

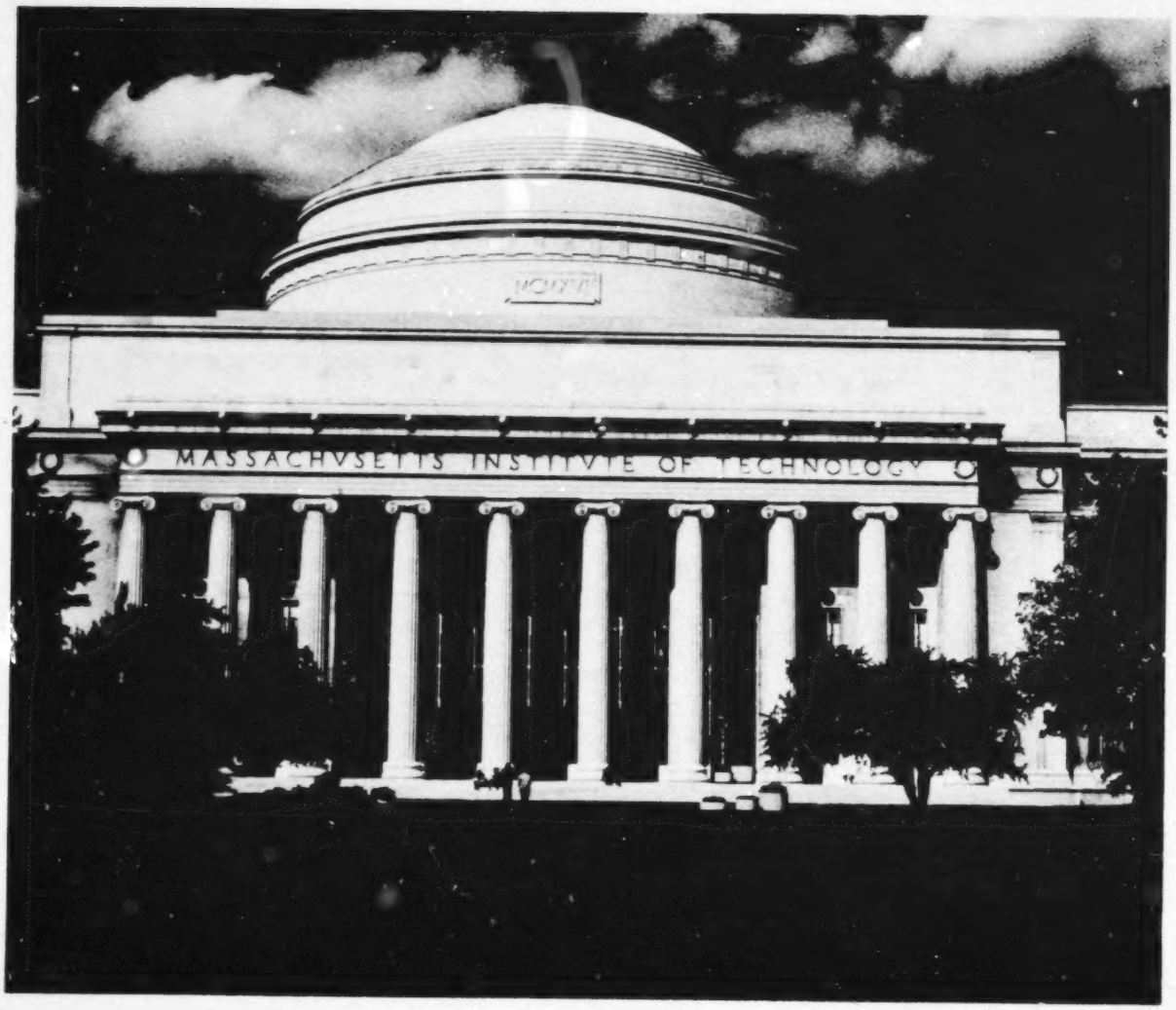
The Program, which is the developmental phase of a prospective College of Science, Technology, and Society, has two broad aims: to explore the influence of social, political, and cultural forces on science and technology, and to examine the impact of technologies and scientific ideas on people's lives. Understanding these relationships calls for a synthesis of diverse branches of knowledge. The Program has therefore assembled a group of faculty members with varied experiences and training to teach and do research, individually and in collaboration, on some of the gravest and most challenging issues of our time.

The Program's mandate reflects a long-standing concern at the Institute about the social ramifications of science and engineering. Thirty years ago, the influential faculty Committee on Educational Survey, chaired by the distinguished chemical engineer Warren K. Lewis, identified "the interplay between science and technology on the one hand and the conduct of human affairs on the other" as a crucial area of study. To increase MIT's capacity to deal with what the Lewis Report called "the most difficult and complicated problems of the age," the Committee proposed the creation of a School of Humanities and Social Science in which distinctions among humanistic, cultural, and social studies would be minimized. It was hoped that an approach which would bring many perspectives together under one roof would stimulate the development of the humanities and social sciences at MIT "at advanced levels" and direct particular attention to the social consequences of science and technology.

Established in 1950, the School soon began to evolve along disciplinary lines rather than around a shared concern with the social dimensions of science and technology. Over time, economics, political science, philosophy, linguistics, and psychology built excellent

educational and research programs within separate, more or less traditional departmental structures. The Humanities Department retained a multidisciplinary form but did not give priority to linking the humanities with science and technology. Like the other departments in the School, it gradually adopted the teaching and research goals of the separate disciplines represented within it.

As a result, in the quarter century following the Lewis Report no substantial educational or research program emerged to focus on the social implications of science and technology. By the mid-1970s, however, the climate had begun to change. A Technology Studies Program was set up to develop an undergraduate curriculum in this field. Three years later, it joined forces with the newly founded Program in Science, Technology, and Society, whose formation reflected the Institute's renewed and expanded commitment to this area of study and research. As this historical sketch suggests, STS can now draw on MIT's great strengths in the social sciences and some branches of the humanities. At the same time, it can reach out to faculty members in engineering and the natural sciences to build integrative approaches to understanding the interactions between science, technology, and society.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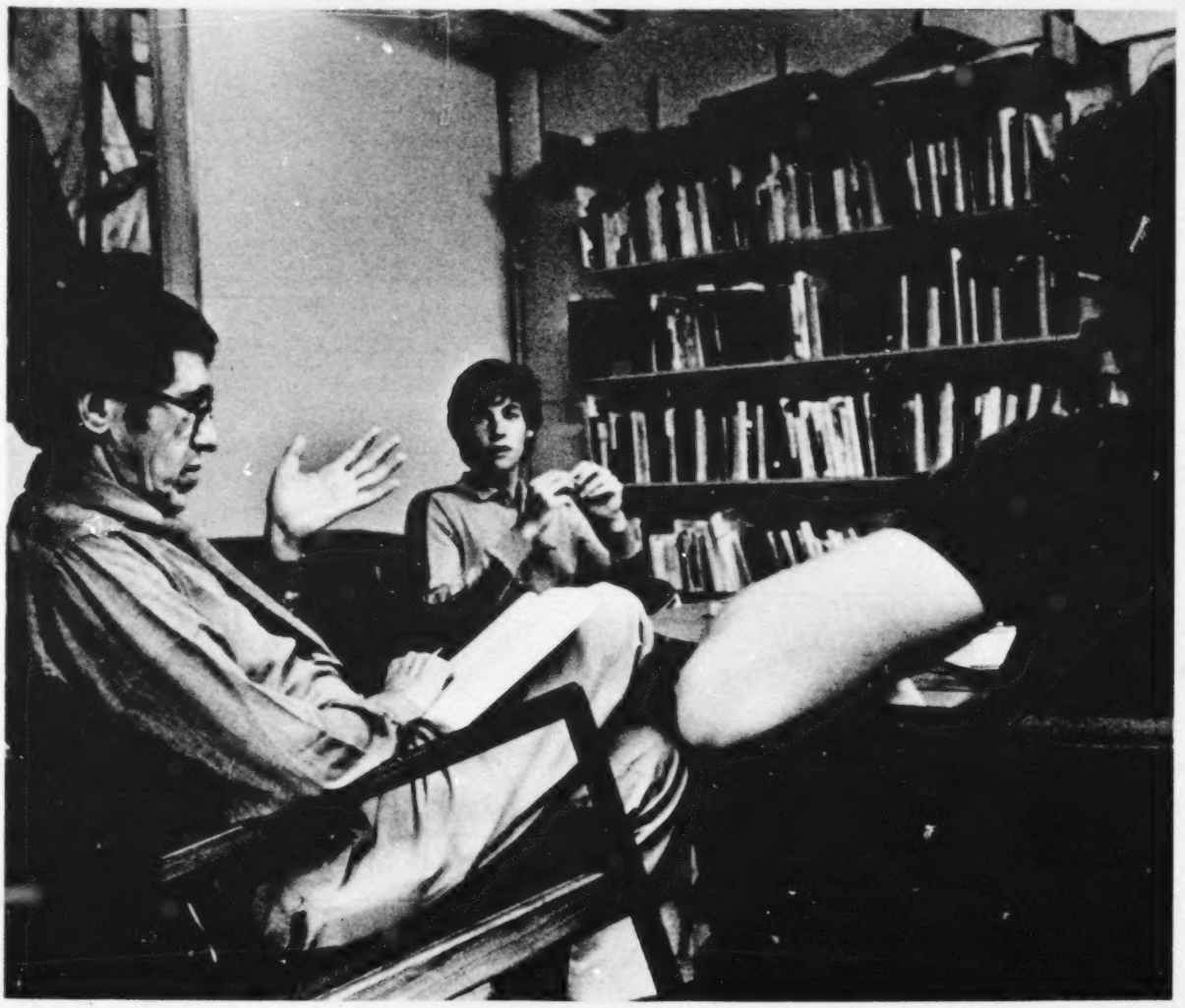


Leo Marx

Teaching

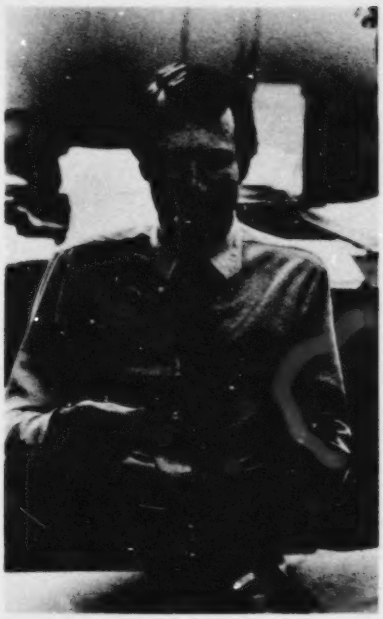
Although based in the School of Humanities and Social Science, STS is meant to be an Institute-wide forum for students and faculty from many different departments. Its core faculty of over twenty come from various fields in the social and natural sciences, engineering, and the humanities. Some are affiliated solely with STS; others hold joint departmental appointments. Faculty members from other parts of the Institute collaborate with the core faculty in teaching and other aspects of the Program's work.

Undergraduate Education

STS proposes to contribute to undergraduate education at MIT in several ways. First, it aims to meet the needs of science and engineering students who seek broader social and intellectual perspectives on their fields. The Program now offers a wide range of courses in five general areas: the history of science; the history of technology; contemporary issues in science, technology, and society; science, technology, and the organization of industrial society; and cultural dimensions of science and technology. These courses examine such issues as the influence of ethical and political values on the work of scientists and engineers; the ways in which scientific concepts and ideas have contributed to the development of modern Western culture; how technological changes have altered the character of human work; and what opportunities and risks are created by the technologies of advanced industrial societies.

A second objective of the Program is to develop courses which will connect questions about the interactions of science, technology, and society directly and in detail to the technical concerns that form the core of scientific and engineering education. This involves working closely with interested scientists and engineers to enlarge the technical core of the MIT curriculum by making specially planned STS courses available as electives or, possibly, as required subjects within departmental major programs.

Several such subjects are being devised with the cooperation of faculty in the School of Engineering. One of these will examine the social implications of design alternatives in engineering and the limits of scientific knowledge in decision making about design, using



Donald L. M. Blackmer

materials structured to parallel the subject matter covered in MIT's principal mechanical and civil engineering design courses. Another subject will be based on an extended study of three specific cases of technical change: the development and evolution of the automobile, the introduction of tape-controlled machine tools into the aircraft industry, and the growth of nuclear power. Through these examples, the course will aim to raise broad issues about the interplay between technologies and the social, cultural, and economic contexts in which they are employed.

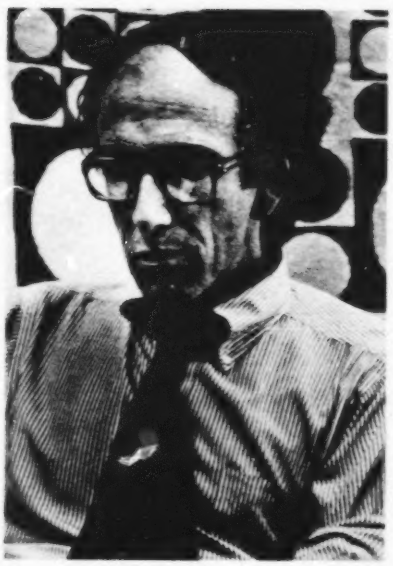
As STS evolves into a College, it has a third, especially challenging educational responsibility: to develop a clearly structured undergraduate degree program. This means fashioning an integrated educational experience for MIT undergraduates who are willing to commit themselves to an unusually exacting course of study. The goal will be to equip those students with what amounts to a double competence: disciplined proficiency in a field of science or engineering and systematic understanding of aspects of the social and cultural contexts in which contemporary science and technology function.

The Program is also experimenting with two other ways of helping students achieve the desired double competence: rigorous interdepartmental majors and coordinated dual majors. Faculty from STS are assisting the Department of Humanities in a new version of the Humanities and Science/Humanities and Engineering majors in Course XXI for students interested in the social and cultural dimensions of science and technology. An experimental program of dual majors is also being planned in cooperation with departments in the School of Engineering.

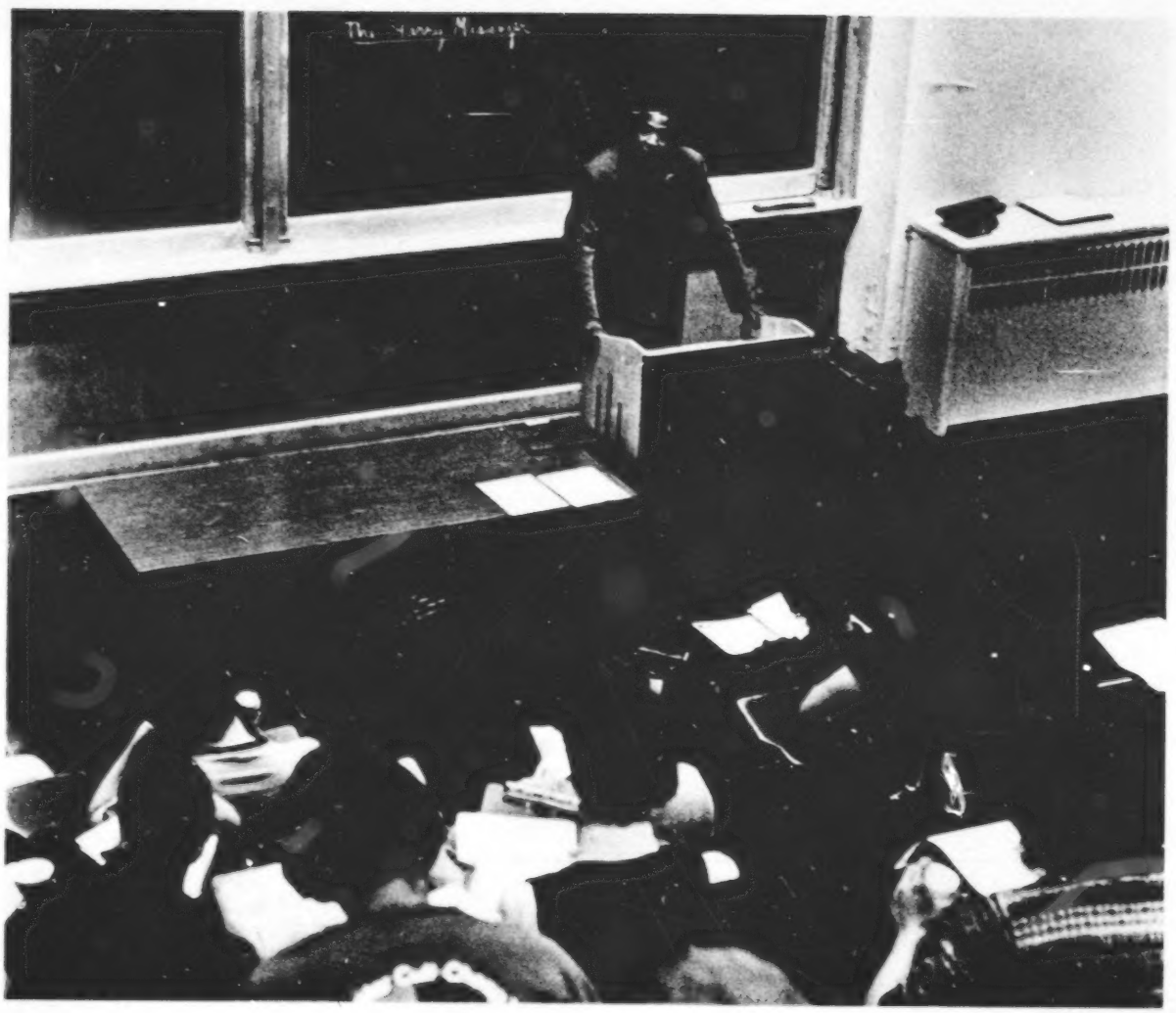
Loren R. Graham

Graduate Education

The Program is developing a variety of arrangements for graduate students who wish to pursue questions relating to interactions of science, technology, and society. STS does not yet have a graduate degree program. However, some graduate-level STS subjects are now offered jointly with several departments. Graduate students are participating in STS reading and research seminars and becoming involved in faculty research projects. With departmental permission, they can structure a special concentration or minor field in STS as part of their degree program. Such arrangements have been made, for example, with students in the Department of Political Science who are specializing in science and technology policy or the comparative study of advanced industrial societies. Financial assistance has been offered to several of these students. Interested students may also take advantage of the opportunity to arrange an interdepartmental doctoral program, supervised by an *ad hoc* committee of faculty members from STS and one or more departments. During the next year or two, further curriculum planning at the graduate level will have high priority.



Kenneth Keniston



Kenneth R. Manning

Research

By its very nature research on the interactions of science, technology, and society cannot be divided into mutually exclusive categories. For convenience of exposition and as an indication of the areas of study which will be emphasized in the future, the Program's current and prospective research projects are arranged below under three general headings: the social study of science; technology and the organization of industrial society; and cultural systems in industrial societies.

The Social Study of Science

Projects under this heading address issues raised by the interaction of science with contemporary political, economic, and ethical concerns. Three areas of research interest are being developed: the history of science, social and political implications of scientific knowledge, and science and public policy.

1.
The History of Science.
Studies in this area examine the role of social, political, and cultural factors in shaping the development of modern science. Several projects focus on the careers and work of individual scientists. A biography of the biologist E.E. Just explores what it meant to be black and a scientist in the United States between the First and Second World Wars (Kenneth Manning). An edited collection of letters and related oral history materials illuminates the life and work of J. Robert Oppenheimer and his wartime experience as head of the U.S. atomic bomb project (Charles Weiner). Studies of the work of physicists from Kepler to Einstein, Bohr, and Fermi examine the scientific imagination and explore the sociology of interactions among scientists (Gerald Holton). Other projects investigate how differences in social and intellectual contexts influence the evolution of scientific ideas and institutions. Included are studies of the relationship of Marxism to science in the Soviet Union (Loren Graham) and the introduction of modern science into China (Peter Buck).

Research in the social study of science builds on previous work by members of the Program on the historical development of ideas and institutions in modern science. Among the topics which Program faculty have pursued are the concept of rigor in mathematics (Kenneth Manning), the origins of quantum mechanics (Thomas Kuhn), and the history of nuclear physics (Charles Weiner).

2.
Social and Political Implications of Scientific Knowledge
Projects in this area examine the relationship of science to social and political values. They trace ways in which scientific theories and findings have been used to support conclusions about society and politics. Several general lines of inquiry are being pursued. One study addresses the question of what science can contribute to the contemporary discussion of ethical issues. It focuses on the extent to which biological accounts of human nature and people's place in nature suggest general guidelines, constraints, or limits on the possibilities for social and political change (Robert Morison).

Thomas S. Kuhn

Other lines of inquiry are primarily historical. One involves research in physics and biology in the 20th century, with an emphasis on how scientists in those disciplines viewed the relationship of their scientific work to issues involving social and political values (Loren Graham). Another explores how and with what consequences the natural sciences have been used as models for research and explanation in the social sciences. This project deals primarily with the application of statistical concepts and methods to the study of society and politics in England and France from the 17th to the 19th century (Peter Buck).

3.
Science and Public Policy
Research in this area is being developed in cooperation with other parts of MIT, including the Department of Political Science and the Center for International Studies. Work within the Program will be directed principally toward the exploration of broad-scale scientific,

Joel Yellin

Peter Buck

institutional, and ethical issues rather than toward the resolution of short-term policy problems. Special attention will be paid to the social, scientific, and technological conditions that have given rise to current policy issues, to the conflicts of interest and value underlying them, and to the possibilities for redefining technological problems so as to broaden the range of possible solutions. Comparative perspectives on science policy will be emphasized, with particular interest in understanding the development and control of science and technology. Other studies will explore how different societies use scientific knowledge in developing public policy and in resolving the controversies that result.

Particular attention will be given to policy issues where substantive scientific matters are themselves in dispute. One current project, dealing with risk and regulation, examines ways of handling scientific uncertainty and changing scientific knowledge in the context of environmental law. It assesses the administrative and judicial treatment of ambiguous scientific data against the background of an extensive analysis of the risks and uncertainties which underlie environmental disputes (Joel Yellin).

Also being explored is a collaborative study on risk which would develop in part from a current seminar involving faculty from the natural and social sciences, engineering, and the humanities. The seminar is addressing questions about risk primarily as they arise in regulatory contexts, where the interplay of scientific analyses with social choice and administrative procedure raises intractable issues.

Another policy-related project deals with the assessment of science itself. Organized around a faculty research seminar, the project will develop and test indicators of the quality of scientific research projects, subspecialties, and institutions. The study will be concerned with models of intellectual influence and theories of scientific progress, with the behavior of scientists concerning the selection or avoidance of research topics, and with their attitudes toward the "social relevance" of basic research (Gerald Holton).

Carl Kaysen

Technology and the Organization of Industrial Societies

Research in this broad category combines the social and historical study of technology with comparative perspectives on the nature and evolution of advanced industrial societies. Projects currently under way or being planned fall into three areas: the history of American technology, the comparative study of technological elites, and the political economy of industrial societies.

1.
The History of American Technology.
Studies in this area deal with the interplay of social, cultural, and technological factors in American industrial development. Two projects trace the ways in which 19th-century America adjusted to machine-based manufacture. One examines the emergence and demise of the New England textile industry (Louis Bucciarelli, Michael Folsom); the other compares different patterns of technological innovation and social adaptation in several early American industrial communities (Merritt Roe Smith). Both are concerned with showing how pre-industrial craft customs, kinship ties, business attitudes, and political ideologies shaped American responses to the increasing scale and speed of mechanized production.

Another focus of interest is on the relationship of work to the rest of social and political life. Particular attention is paid to conflicts concerning the distribution of power and authority in the workplace. A project centered on the development of automatically controlled machine tools after World War II explores how the social relationships and organizational structures of industrial production influenced the design and development of that new technology (David Noble).

2.
The Comparative Study of Technological Elites
A broad collaborative research project is being developed in this area to compare the selection, training, and career patterns of high-level professionals with engineering background in France and the United States. It will assess critically the claim that modern industrial

Merritt Roe Smith

societies produce, in many of their technically trained members, a common "technocratic" value orientation derived or generalized from universally applicable problem-solving paradigms (Kenneth Keniston, Leon Trilling).

It is expected that other independent projects focused on technological elites will develop in conjunction with this study. One project being considered would examine how the value orientations and problem-solving styles of American engineers have been affected by their interactions with the military in the 19th and 20th centuries (Merritt Roe Smith).

Emma G. Rothschild

3.
The Political Economy of Industrial Societies

A collaborative research project in this area will analyze the constraints and areas of choice associated with the technologies of advanced industrial societies. It will examine the range of social, economic, and political institutions which have proved compatible with advanced technologies, and explore ways in which those technologies might be further developed or modified to satisfy social needs. Organized as a series of coordinated studies of the technical and social problems of particular industries, the project will focus on differences among Western European and North American countries in investment and labor market strategies, in plans for technological development, and in the organization of production within the same industry (Charles Sabel, Michael Piore, Suzanne Berger, Carl Kaysen, Emma Rothschild).

Cultural Systems in Industrial Societies

This part of our research program will aim to clarify the role of historically transmitted ideologies and patterns of belief in shaping the interactions of science and technology with the rest of contemporary life. The social significance of scientific and technological innovations is seldom intrinsic to them, but derives instead from the preexisting interpretive frameworks – religious, political, philosophical, literary, and aesthetic – which people use to comprehend those changes as they occur. This imparting of meaning and significance to developments in science and technology is one of the vital mediating functions which such cultural systems perform in industrial societies.

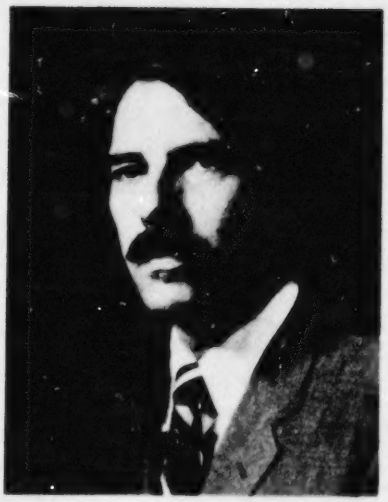
In focusing on the mediating role of cultural frameworks, STS faculty will be seeking to understand the extent to which distinctive patterns of belief tend to be associated with the characteristic socioeconomic and political structures of modern industrial societies. To what degree have people's prior conceptions of change, and of the nature of history, helped to determine their reactions to innovation? How have their conceptions of themselves and of their relationships with nature been altered by their experiences with complex, large-scale technologies? In what ways have contemporary modes of thought and feeling been affected by such radical changes in communications as movies, radio, television, and the computer? How can industrialized, secular societies, with their strong commitments to purposive rationality, satisfy those needs for meaning and value – for transcendence of mere self-interest – which in most past cultures have been satisfied by religion, art, and various popular modes of expression?

Questions like these provide the focus for a study, now in progress, on the place of "pastoralism" in contemporary American culture. Pastoral ideals express a desire, in the face of the growing power and complexity of organized society, to recover a simpler way of life, closer to "nature." This study examines how the pastoral mode of thought has made itself felt not only in literature and art, but also in current social and quasi-political movements like environmentalism, the cult of voluntary simplicity, the migration to the

Sherry R. Turkle

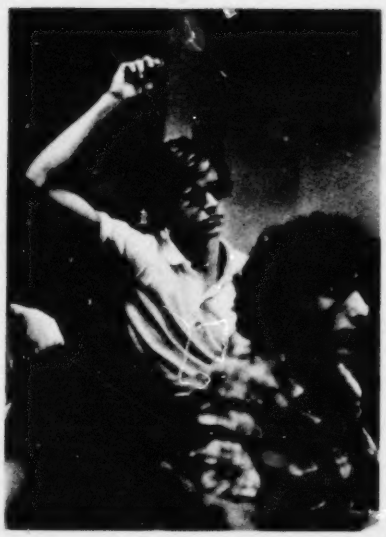
suburbs, and the politics of disengagement favored by the radical counterculture (Leo Marx).

Two other projects deal with scientific and technological systems as symbolic structures which give meaning to human experience. The first examines the social and psychological factors which influence how people relate to computers (Sherry Turkle). The second deals with the ways in which different technological designs symbolize or otherwise embody the distinctive forms of moral and political life found in different societies (Langdon Winner).



Louis L. Bucciarelli

Langdon Winner



Other Program Activities

In addition to its teaching and research programs, STS organizes a number of activities designed to respond to the interest of academic and lay audiences in understanding the social dimensions of science and technology. The Program arranges faculty seminars and public lectures, offers senior and postdoctoral fellowships, and cosponsors the quarterly review *Science, Technology, and Human Values.*

Faculty Seminars and Public Lectures

STS faculty seminars and public lectures bring together a wide range of people from the MIT community to explore issues related to the work of the Program. The Program's lecture series provide occasions for speakers from outside the Institute to address questions of broad social and scholarly significance. These series, which usually extend through a semester or an academic year, have dealt with such topics as technology and work, social change and the life sciences, and computers and society.

Faculty seminars sponsored by STS focus on problems which lend themselves to collaborative investigation by faculty and advanced students from various Schools and departments at MIT. The first of the STS seminars, on the limits of scientific inquiry, resulted in a series of papers which were published as a special issue of *Daedalus* and subsequently appeared in book form. Other seminars have been organized or are being planned around such themes as risk and regulation, environmental studies, and the development and use of indicators for assessing the quality of science.

Fellows Program in Science, Technology, and Society

STS offers senior and postdoctoral fellowships for research on the interactions of science, technology, and society. These fellowships will help overcome the shortage of well-qualified scholars committed to working in this field by providing opportunities for research not easily accommodated within traditional disciplines and departmental structures. They are intended for people who have demonstrated their ability to do advanced work in a relevant discipline and who would profit from a period of study and research on the problems of

Charles Weiner

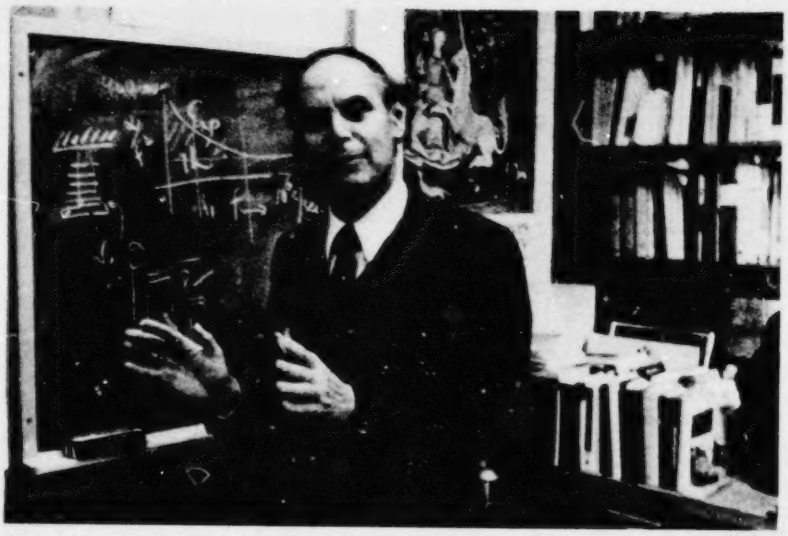
science, technology, and society. Most of the fellows are expected to be either recent Ph.D.s or junior faculty members. Awards may also be made to more senior persons, including established scholars interested in changing the focus of their research and teaching, as well as individuals from government and industry.

Fellows are chosen through a national competition. The major selection criteria are: (1) a record of outstanding achievement in a branch of science, engineering, the social sciences, or the humanities; (2) evidence of strong commitment to research in an area involving the interplay of science, medicine, or engineering with the humanities or the social sciences; and (3) a proposed program of study and research for the fellowship year, usually entailing substantial work in a field or discipline beyond the candidate's primary area of expertise.

Science, Technology, and Human Values

Science, Technology, and Human Values is a quarterly review sponsored jointly by STS and the Kennedy School of Government at Harvard University. Founded in 1972 by Gerald Holton as a newsletter for Harvard's Program on Public Conceptions of Science, the review is being converted into a regular scholarly journal to be published by the MIT Press. The journal will be housed in the Program's quarters, and members of the STS faculty will serve on its editorial board.

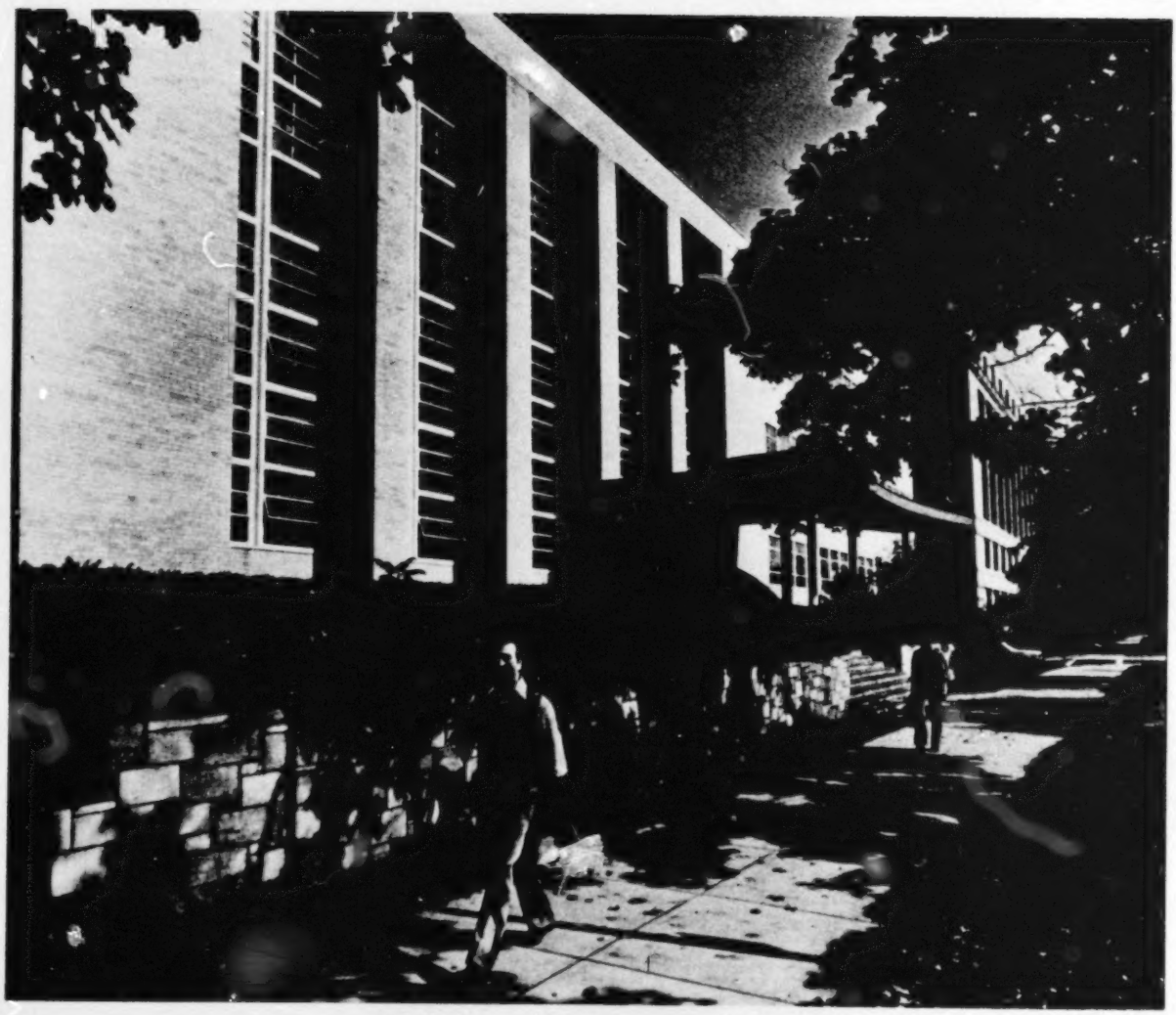
The review publishes scholarly research and critical analyses on such topics as value conflicts generated by developments in technology and the natural and social sciences, ethical issues encountered by scientists and engineers in their professional capacities, and questions pertaining to the public understanding of science and technology. *Science, Technology, and Human Values* also carries bibliographies, book reviews, literature surveys, reports on work in progress, analyses of legislation and government programs, and descriptions of innovative educational programs. The journal should serve as an important vehicle for focusing the attention of a wider national audience on the social, intellectual, and educational concerns of STS.



Gerald Holton

Elting E. Morison

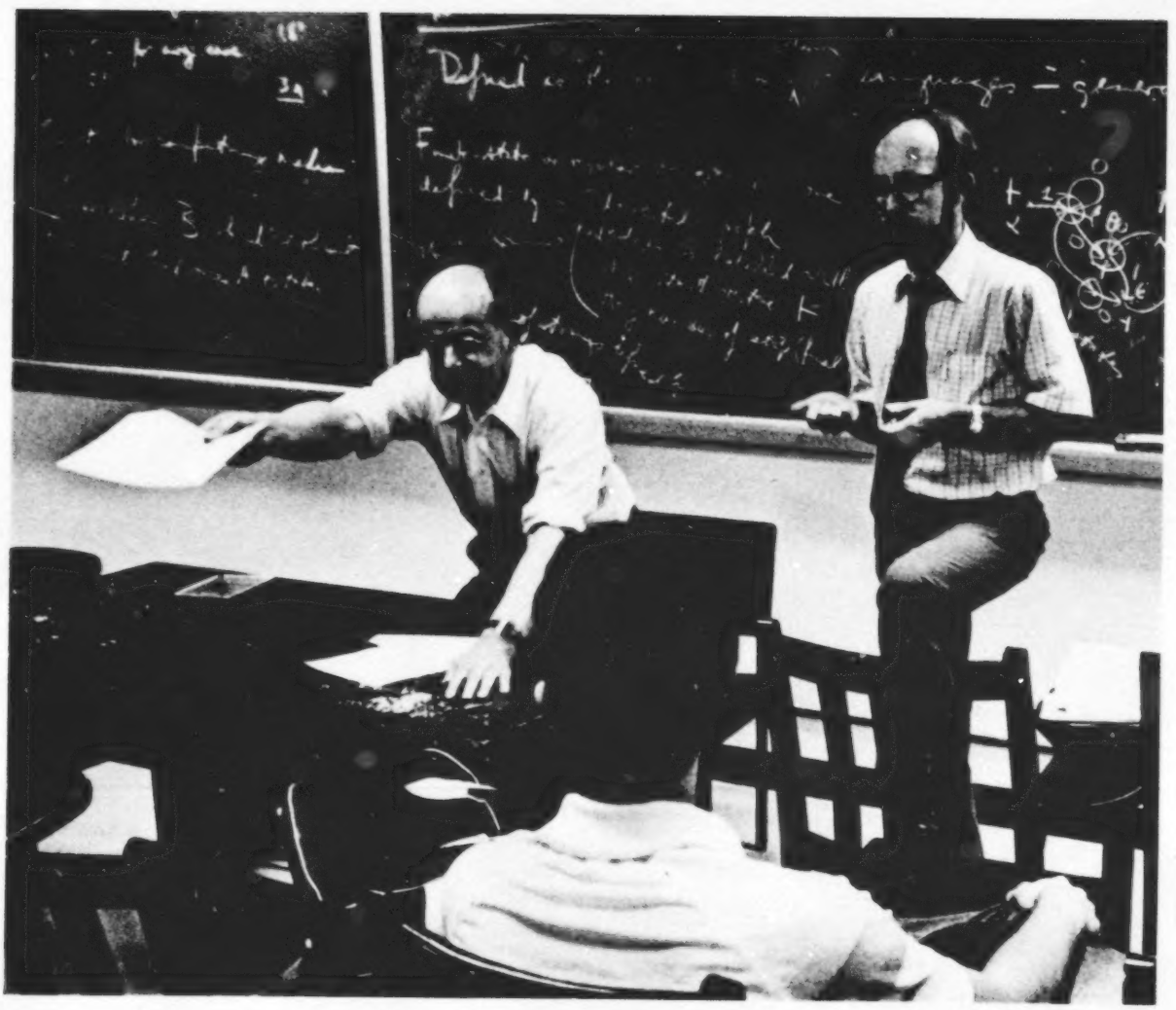
Leon Trilling



This building, at 70 Memorial Drive, is being renovated to provide new quarters for the Program.

Funding

The Program in Science, Technology, and Society has received major funding from five private foundations. STS was begun in 1977 with grants totalling $2.5 million from the Alfred P. Sloan Foundation, the Andrew W. Mellon Foundation, and the William and Flora Hewlett Foundation to be used as developmental funds for the Program's [illegible]al years of operation. In 1978, the Program received a grant from the Max C. Fleischmann Foundation for the establishment of permanent quarters on the MIT campus at 70 Memorial Drive (Building E51). This building, which STS will share with MIT's Sloan School of Management, will house the Program's faculty and staff and provide facilities for lectures, seminars, research projects, and other Program activities. In 1979, the Exxon Education Foundation awarded STS a grant to support a Fellows Program in Science, Technology, and Society, beginning in the 1980-81 academic year. Smaller grants have also been received from the Barker Foundation and the Atlantic Chemical Manufacturing Corporation.



Subjects Offered

The following subjects are included in the Program's curriculum in 1980 and 1981. In addition to these, interested students can find a number of subjects offered elsewhere at MIT which deal with interactions of science, technology, and society. These subjects are described in the Courses and Degree Programs Issue of the MIT Bulletin.

General Subjects

STS 100J/101J
Reading Seminar in Humanities, Science, and Technology I & II
Reading and discussion of major primary and secondary works which illustrate or examine the interactions of science, technology, and society.
P. Buck, R.M. Douglas

STS 110/111
Special Topics in Science, Technology, and Society
For students who wish to pursue special studies or projects with a member of the Program.
Staff

STS 120/121
Advanced Topics in Science, Technology, and Society
Open to qualified graduate students who wish to pursue special studies or projects with a member of the Program.
Staff

History of Science

STS 200
Science from the Renaissance through the Enlightenment
A treatment of the Scientific Revolution and its consequences during the Enlightenment — the origins of scientific thought in the West, the emergence of science as a new intellectual and social force, and the influence of Newtonianism on 18th-century physical and life sciences.
K. R. Manning, I. Kaplan

STS 201
History of 19th- and 20th-Century Science
Survey of the growth of the physical and biological sciences since the end of the Enlightenment. Introduces such scientific concepts and ideas as evolution, electromagnetism and field theory, relativity and cosmology, quantum mechanics, genetics and molecular biology, ethology, and sociobiology.
L. R. Graham, P. Buck

STS 205J
Nature of Scientific Knowledge
An introduction to fundamental philosophical problems concerning the nature of science and its development.
Term 1: P. G. Horwich
Term 2: T. S. Kuhn

STS 206
Social and Political Implications of Science
Historical and contemporary studies of the interaction of science with social and political values, with an emphasis on how scientists have viewed the relationship of their scientific work to moral and ethical issues.
L. R. Graham, P. Buck

STS 207J
Scientific Knowledge, Social Values, and Politics
A graduate subject focusing on the changing role of scientific ideas and arguments in social and political discourse from antiquity to the present; emphasizes the social and political implications that have been drawn from the natural sciences.
L. R. Graham, P. Buck

STS 210
American Science since the 1930s
History of American science and technology since the Depression; covers patterns of funding, international links, government-industry-university relations, the rise of "big science," and the response of the scientific community to new social responsibilities.
C. Weiner

STS 211
Russian Science and Society
An introduction to the history of Russian, especially Soviet, science; topics include the introduction of Western science to Russia, the influence of Marxism on Soviet scientific development, the social and political context of Soviet science, and the role of dissidents in Soviet scientific life.
L. R. Graham

STS 212
Science and Society in Modern China
Examines the social, political, and cultural aspects of the development of science in modern China in the context of traditional Chinese conceptions of natural and social order, the relations between philosophy and material technology, and the connections between knowledge and political power.
P. Buck, L. Trilling, R. M. Douglas

STS 220
History of Modern Mathematics
The evolution of mathematics, from the development of algebra in the 16th century through the rigorization of mathematical theory in the 19th century.
K. R. Manning

STS 221J
Topics in the History of Physical Science
By careful reading and analysis the class attempts to reconstruct some significant episode in the evolution of physical science; different topic each year.
T. S. Kuhn

STS 222J
Historical Interpretation of Scientific Thought
A graduate subject involving close reading of selected primary sources in order to reconstruct a significant chapter in the development of scientific thought; different topic each year.
T. S. Kuhn

STS 230
Emergence and Growth of New Research Fields
An historical-sociological exploration of individuals, ideas, institutions, and national environments in the formation and development of new research fields; an analysis of the factors which can bring a given field to the forefront.
C. Weiner

STS 231J
Understanding the Discovery Process —An Historical Approach
Using case histories of scientific and technological discoveries, tests ideas about discovery, heuristic reasoning, and the scientific process.
W. D. Kingery

History of Technology

STS 241
Biography in Science
Examines the use of biography to illuminate aspects of the development of science; compares biography as a literary genre in the history of science and in other disciplines; analyzes critically the various primary sources used in writing biographies of scientists.
K. R. Manning

STS 300
History of Technology in America I: 1787-1876
A study of America's "pre-industrial society" and its transformation into an industrial civilization; examines how and why technology developed as it did, and what the consequences of its development were for society.
M. R. Smith, D. F. Noble

STS 301
History of Technology in America II: 1876-the Present
A continuation of STS 300, focusing on the maturation of industrial capitalism as seen in the emergence of large industrial corporations, national and international markets, and a professional, organized, science-based industry.
M. R. Smith, D. F. Noble

STS 302
Culture and Technology in America: The 19th Century
An investigation of the origins of a technological society in the United States and the culture fostered by that society, with a special focus on the founding of industry in 19th-century New England.
L. L. Bucciarelli

STS 310J
Industrialization and Cultural Change in 19th-Century America
A comparative study of 11 communities discussing why some entered the industrial age more easily than others. The work ethic, business attitudes, political ideologies, and the growing speed and scale of modernized production are among the factors treated.
M. R. Smith

STS 315J
The Industrial Revolution: A Social and Cultural History
An examination of the industrial revolution, 1750-1830, in terms of the context in which it occurred and its impact on society and culture.
B. Mazlish

STS 320
Arms, Power, and the Engineer
Investigates the cultural, social, and technical factors which underlie the exercise of political power, and examines the role of scientists and engineers in making decisions concerning the effects of "high" technology on national power and human welfare.
L. Trilling

Contemporary Issues in Science, Technology, and Society

STS 400
Science, Technology, and Society: Problems of Innovation
An examination of historical and contemporary conflicts about the ways in which scientific ideas and technical systems should interact with society and individuals.
L. R. Graham, with P. Buck, L. Marx, R. S. Morison

STS 401J
Rationality, Risk, and Choice in Industrial Society
Survey of the environmental and health consequences of 20th-century technology, as viewed from historical, ethical, legal, and scientific perspectives. Concludes with a discussion of changing concepts of human rights in modern technological society.
J. Yellin

STS 402
Innovation and Society
A discussion of the complex interplay between major technological innovations and changing patterns of life in modern industrial society.
L. Trilling

STS 410
Ethical Issues in Science and Engineering
Seminar on the ethical issues which arise in contemporary technical activity. Analyzes the roles and responsibilities of technical experts and advisors, examines problems faced by scientists in basic research and by engineers in industry and government, and discusses the responses of institutions and professional societies.
C. Weiner

STS 411J
Legal, Ethical, and Scientific Issues in the Regulation of Dangerous Industries
Upperclass seminar on the regulation of industrial activities which affect the health and safety of the public; discusses philosophical, economic, and ethical issues related to valuation of human life for regulatory purposes.
J. Yellin

STS 412J
Ethics and Technocrats
Assists the student in clarifying the ethical commitments of his or her own professional life as an engineer, a planner, a systems analyst, an economist, or other technical professional.
L. Winner, M. L. Manheim

STS 413J
Public Controversies on the Control of Technology
The role of scientists and engineers in controlling the damaging side effects of technologies on which industrialized nations are now dependent; topics include: dangers of the nuclear arms race; environmental and health hazards; scientists and engineers as advisors.
C. Weiner, B. T. Feld, H. W. Kendall

STS 420
Computers and People
A study of the computer presence in our society, including the computer impact on large social processes, on the individual, and on sciences of the mind and images of humanity.
S. R. Turkle

STS 421J
Computer Cultures, Computation, and the Individual
A graduate-level research seminar studying the computer as it affects individuals and contemporary culture; topics include computer subcultures, computer metaphors, and relationships among people, machines, and programming.
S. R. Turkle

STS 425
Technology and the Individual
An examination of the non-instrumental or unintended human effects and uses of technologies; cases studied include: computers and intensive users, television and viewers, engineering systems and engineering students, "automated" tools and workers.
K. Keniston, S. R. Turkle

Science, Technology, and the Organization of Industrial Society

STS 439
Engineering Design in Social Context
Examines social, ethical, and technical issues in design. Contrasts engineering design with design in the arts, architecture, city planning, and political theory.
L. L. Bucciarelli, L. Winner

STS 500
Professions
An application of the insights and methods of sociology, history, and anthropology to understanding the individual and social experience of people in the technical professions, especially medicine, science, and engineering.
S. R. Turkle, C. Weiner

STS 501
The Automobile: Mass Production and Mass Consumption
Through a close study of the rise and decline of the automobile industry, explores the idea of a dominant national industry and the ways in which such an industry is influenced by and influences the evolution of society.
E. G. Rothschild, C. F. Sabel

STS 510J
Modern Social Theory
A graduate subject which focuses on three stages in the development of the modern state: political absolutism, the property-contract state, and the corporate-welfare state.
C. F. Sabel, J. Cohen

STS 511J
Theories of Technological Society and Politics
A study of political theory examining the relationship between technology and politics; attention paid to ways in which social science, Marxism, liberalism, phenomenology, and critical theories of technological societies have dealt with this question.
L. Winner

STS 520
Technology as a Social Process
A critical study of the concept of technological determinism, beginning with an historical exploration of the American institutions which have fostered technological development and ending with two case studies (sewer systems and automated production machinery).
D. F. Noble

STS 522
Seminar in Alternative Technology
An inquiry into possible alternatives—utopian, anarchist, socialist—to the large-scale, complex, high-energy, technological systems which dominate modern social life.
L. Winner

STS 530
Growth and Structure of Urban Environments
Upperclass seminar on historical and theoretical perspectives on urban structure and growth, as affected by technological change.
J. Yellin

Cultural Dimensions of Science and Technology

STS 540
The World of American Food
A study of the U.S. food economy and its consequences for the world, including changes in diet, changes in food technology, and political changes.
E. G. Rothschild

STS 551J
Higher Education in American Society
A graduate-level seminar focusing on the social role of higher education in technologically advanced societies.
C. Kaysen

STS 552J
Youth and Industrial Society
Studies youth groups as critics and supporters of industrial-technological societies; examines the role of youth in America during the 1960s and 1970s, in pre-Hitler Germany, and in Czarist Russia.
K. Keniston

STS 600
Technological Society and the Recovery of "The Natural"
The pastoral ideal (exemplified by Thoreau's *Walden* and the "counterculture" of the 1960s) considered as a critique of (or possible alternative to) a complex society characterized by high technology.
K. Keniston, L. Marx

STS 601J
Literature, Ideology, and National Experience in the United States
A study of the interplay of imaginative literature, collective mentality (ideology), and national experience in the United States, with emphasis on opposed concepts of the meaning of that experience.
L. Marx

STS 602
The Machine: Metaphor, Fact, and Theory
A discussion of the centrality of the machine metaphor in modern thought and expression, emphasizing the place of this metaphor in theories of technological society and conceptions of "the machine" as a vehicle of both alienation and liberation.
L. Marx, L. Winner

STS 610J
Writing about Work
For students interested in writing about work and their own work experience. The first part uses economics, sociology, history, and fiction to study various kinds of work; in the second part students analyze their personal work experiences and write critical essays or short fiction.
C. F. Sabel

STS 611J
Writing: Technology and Society
A writing subject focusing on the relationship between technology and society; uses four current and historical topics as the basis for instruction in a variety of non-fiction forms: historical writing; social analysis or political criticism; policy reports.
E. G. Rothschild, with K. Keniston, K. R. Manning, J. Paradis, J. Wilkes

STS 625J
American Television: A Cultural History
Television's evolution as a technology of story-telling and communication, studied from anthropological, literary, and cinematic perspectives.
D. Thorburn

Faculty and Staff

Donald L. M. Blackmer
Director of the Program in Science, Technology, and Society;
Associate Dean of the School of Humanities and Social Science;
Professor of Political Science

As a specialist in Soviet and European, especially Italian, communism, Professor Blackmer is concerned with the evolution of modern industrial societies. He has written *Unity in Diversity: Italian Communism and the Communist World* and (with Sidney Tarrow) co-edited *Communism in Italy and France*. He has a particular interest in comparative analysis of the politics and sociology of work and the labor movement.

Peter Buck
Assistant Director of the Program in Science, Technology, and Society;
Lecturer in the History of Science

Dr. Buck is interested in comparative studies in the social history of science, with an emphasis on modern science in China and the United States, and in interactions between the natural and social sciences, especially sociology and statistics. His book, *American Science and Modern China*, will appear in 1980. He is currently working on a history of statistical thinking in relation to the study of demographic change.

Louis L. Bucciarelli
Associate Professor of Engineering and Technology Studies

Professor Bucciarelli's interests include aerospace structural engineering, solar energy systems analysis, and the history of science and technology. Through his research on the textile industry in New England with Michael Folsom, he is developing approaches to the study and teaching of the history of industrial technology. In addition, he is investigating early 19th-century theories of elasticity and, with Nancy Dworsky, has written a book on the subject, *Sophie Germain: An Essay in the History of the Theory of Elasticity*, to be published in 1980.

Loren R. Graham
Professor of the History of Science

Professor Graham is an expert on the history of Russian, especially Soviet, science. He is the author of *Science and Philosophy in the Soviet Union* and *The Soviet Academy of Sciences and the Communist Party, 1927-1932*, as well as numerous articles in such fields as eugenics and cybernetics. He is also interested in the relationship between science and sociopolitical values and is currently working on a comparative historical study of science-value interactions.

Gerald Holton
Visiting Professor (MIT);
Mallinkrodt Professor of Physics and Professor of the History of Science (Harvard University)

Professor Holton's research interests are in the physics of matter at high pressure and in the history of modern physics. He is also interested in the public understanding of science and in the relations among science, technology, and human values. His publications in the history of science include *Thematic Origins of Scientific Thought: Kepler to Einstein* and *The Scientific Imagination: Case Studies*.

Carl Kaysen
David W. Skinner Professor of Political Economy

Professor Kaysen's interests center on areas where economics, sociology, politics, and law intersect. He has written on government regulation of business, price and market theory, the economics of research, higher education, and the sociology of business. In addition, he has served as Deputy Special Assistant for National Security Affairs to President Kennedy, from 1961 to 1963; Director of the Princeton Institute for Advanced Study, from 1966 to 1975; and Director of the Sloan Commission on Government and Higher Education, from 1977 to 1979.

Kenneth Keniston
Andrew W. Mellon Professor of Human Development

Professor Keniston has done extensive research on youth movements and their psychology, with an emphasis on political and self-transforming movements in America during the last decade. His books on this subject include *The Uncommitted: Alienated Youth in American Society*, *Young Radicals: Notes on Committed Youth*, and, most recently, *All Our Children: The American Family Under Pressure*. He is also interested in the training and career patterns of high-level engineers and, with Leon Trilling, is currently engaged in a comparative study of technical elites in France and the United States.

Thomas S. Kuhn
Professor of Philosophy and History of Science

Professor Kuhn is widely known for his work in the history and philosophy of science. In addition to his influential book *The Structure of Scientific Revolutions*, he is the author of several major monographs on the history of the physical sciences, including the recently published *Black-Body Theory and Quantum Discontinuity: 1894-1912*. His current research interests center on questions in the philosophy of language which bear on the philosophy of science, and on questions concerning the nature of cognitive processes.

Kenneth R. Manning
Associate Professor of the History of Science

Professor Manning has a broad background in the history of scientific development from the Renaissance through the 19th century. As part of his research on the role of blacks in American science and technology, he is writing a biography of the black scientist E. E. Just (1883-1941), who did pioneering work on cell life. He has also written on the development of mathematical theory and is preparing a study on "The Concept of Rigor in the History of Mathematics."

Leo Marx
William R. Kenan Professor of American Cultural History

Professor Marx is concerned with the role of historically transmitted ideologies and patterns of belief in shaping the interactions of science, technology, and society. He is the author of *The Machine in the Garden: Technology and the Pastoral Ideal in America* and is now completing a book, tentatively entitled *The Pandering Landscape: American Pastoralism Reconsidered*, on how the pastoral mode of thought has made itself felt in current social and quasi-political movements.

Michael Meyer
Assistant Professor of Civil Engineering

Professor Meyer is a specialist in Transportation Systems Management policy and has published several articles on TSM in the MIT *Center for Transportation Working Papers*. He has become increasingly interested in urban transportation planning and in the role of applied social sciences in transportation policy and management. He is also concerned with how changes in technical education can contribute to the development of more prudent approaches to technical innovation.

Elting E. Morison
Elizabeth and James Killian Class of 1926 Professor, Emeritus

Professor Morison has taught history and industrial management and is now chiefly interested in the history of technology and the relations between technology and work, particularly the way in which evolving technology has altered the character of human work and the relationship between people and their machines. He is the author of numerous books, including *Men, Machines, and Modern Times* and *From Knowhow to Nowhere*, and is the editor of an eight-volume collection of *The Letters of Theodore Roosevelt*.

Robert S. Morison
Visiting Professor of Science and Society

Before coming to MIT, Dr. Morison taught at Cornell University, where he was first professor of biology and Director of the Division of Biological Sciences and later Richard J. Schwartz Professor of Science and Society. His interests include medicine and public health, medical ethics, and biological approaches to the study of human behavior. With Gerald Holton he co-edited the Spring 1978 issue of *Daedalus* on "The Limits of Scientific Inquiry." He has written numerous articles on ethical and scientific issues posed by biological research.

David Noble
Assistant Professor of the History of Technology

Professor Noble, whose interests and research bridge the social sciences and engineering, has been instrumental in developing and conducting the Technology and Policy Proseminar. In his first book, *America by Design: Science, Technology, and the Rise of Corporate Capitalism*, he explored the linkages between technological and social change. His current research, focused on the development of automatically controlled machine tools and industrial robots, examines how the design and deployment of new technologies reflect the social relations of production.

Emma G. Rothschild
Associate Professor of Technology, Society, and Rhetoric;
Director of the Writing Program

Professor Rothschild is interested in the world food economy, the U.S. automobile and energy industries, and world armaments. Her publications include *Paradise Lost: The Decline of the Auto-Industrial Age*, as well as articles on economics, political science, and technology. She is a member of OECD's "Expert Group on Science and Technology in the New Socio-Economic Context," and a co-author of the group's forthcoming report.

Charles Sabel
Assistant Professor of Social Science

Professor Sabel is interested in the politics and sociology of work, law, and art in comparative perspective; theories of the state; and political economy. At present he is researching labor-management relations and economic performance in order to demonstrate the connection between systems of plant-level collective bargaining and patterns of unemployment and inflation in different economies. He is co-author (with G. Muller, U. Rodel, F. Stille, and W. Vogt) of a German book on *Tendencies Towards Economic Crisis in Contemporary Capitalism* and has written articles on corporatism and labor markets. A book on the sociology of the labor market will appear shortly.

Merritt Roe Smith
Professor of the History of Technology

Professor Smith specializes in the history of 18th- and 19th-century industrial technology; he is currently examining the interaction of technological and social change in early American industrial communities. He is the author of *Harpers Ferry Armory and the New Technology*, as well as numerous articles on various aspects of technological development, and is writing a book on technology and culture in 19th-century America.

Leon Trilling
Professor of Aeronautics and Astronautics

Professor Trilling's engineering interests focus on fluid mechanics and rarefied gas dynamics. He is also concerned with the social and historical study of technology. With Kenneth Keniston he is studying the training and career patterns of high-level engineering professionals in France and the United States. At MIT he has been actively involved in developing guidelines for dual competency in engineering and related areas of the humanities and social sciences, including science, technology, and society.

Sherry R. Turkle
Associate Professor of Sociology

Professor Turkle is interested in the sociology of science, particularly sciences of the mind. Her book *Psychoanalytic Politics: Freud's French Revolution* studies the politics within the psychoanalytic movement and the interaction of this movement with other political, social, and intellectual currents. She is now investigating the impact of the computer on the individual and society.

Charles Weiner
Professor of the History of Science and Technology

Professor Weiner's work focuses on the history of contemporary science and technology. His fields of interest include the history of nuclear physics, the controversy surrounding genetic experimentation, and the development of public interest science. In addition to writing articles on the social history of science, he has edited several volumes including *History of 20th Century Physics* and, with Alice Kimball Smith, *Robert Oppenheimer: Letters and Recollections*, to be published in 1980. He recently completed a project documenting the history of the recombinant DNA research controversy.

Langdon Winner
Associate Professor of Technology Studies and Political Science

Professor Winner is interested in questions of science, technology, and human values and in the relation between political theory and technological design. His book *Autonomous Technology: Technics-Out-of-Control as a Theme in Political Thought* addresses the question of why modern technology seems to have developed into a powerful imperative influencing social and political action. He is now investigating how the categories and perspectives of Western moral and political philosophy can be applied to the ways in which technological systems are planned, designed, and built.

Joel Yellin
Associate Professor of Social Science; Lecturer in Political Science

Professor Yellin has extensive research experience in theoretical physics and has published articles on environmental law, urban economics, and population biology. His current interest lies in the historical emergence of concepts of risk and their use in societal decisions concerning science and technology. He is writing a book on the role of risk in the American judicial process, with particular attention to major environmental cases. With Professor Paul Joskow, he has recently completed an article on nuclear reactor siting, and is collaborating in research on population genetics with Professor Paul Samuelson.

Research Associates, 1979-80

Frank Emspak

Michael B. Folsom

Marcel LaFollette
Editor, *Science, Technology, and Human Values*

Lawrence McCray
(jointly with the
Center for International Studies)

Fellows, 1979-80

Janet Corpus

Evelyn Fox Keller

Administration, 1979-80

Donald L. M. Blackmer
Director

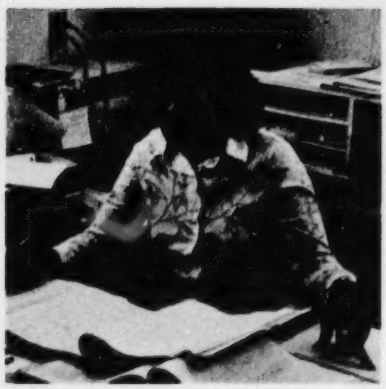
Peter Buck
Assistant Director

Martha L. Taylor
Assistant to the Director

Reta M. Lee
Administrator

Rita Glover
Administrative Secretary

Martha L. Taylor



Reta M. Lee